NEW JERSEY
TURNPIKE AUTHORITY

DESIGN GUIDE
FOR THE
DEVELOPMENT OF CADD FILES

February 17, 2003

*Please note highlighted areas throughout document for latest revisions.

INTRODUCTION

The New Jersey Turnpike Authority has an in-house CADD group. It is the Authority's intention to have in-house staff as well as design consultants develop all design work in CADD. At the conclusion of all projects all CADD files will be turned over to the Authority.

In order to assure uniformity in the drawing files and supporting documentation this guide has been developed. The following information will cover most areas of CADD file development and the information to be provided to the Authority. Should the information delivered not meet the Authority's requirements you will be directed to make the necessary changes without additional compensation.

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GENERAL STANDARDS

1.1 INTRODUCTION

This manual presents standards/guidelines for the preparation of all contract plans for the New Jersey Turnpike Authority, utilizing Computer Aided Design and Drafting (CADD) software, hardware and methods. Inquiries regarding the contents of this document should be directed to Bob Rosenbaum of the Engineering Department at (732) 247-0900 / Ext. 5223. The current Internet address is rosenbaum@turnpike.state.nj.us.

1.2 CHANGES TO THE STANDARD

The NJTA CADD system is an evolving process. In general, changes to the system occur because of three factors: 1) additional users and functionality; 2) discovery of, and subsequent fixing of flaws or bugs; 3) changes to utilize advantages of more current technology and software versions. Most of the time, one or more of the above factors are causing changes to the Standard. Therefore, it is reasonable to expect occasional updates to this document. Users of this document are cautioned to frequently inquire about changes hereto, in order to ensure that they also are using the latest version. The latest revision date will be shown on the cover page.

1.3 PLATFORMS

The NJTA currently utilizes the AutoCad software application running on IBM-PC compatible workstations. The standards presented herein are for AutoCad 2002.

1.4 ADDITIONAL GUIDANCE FOR CONSULTANTS

A Consultant is currently only required to meet the requirements of various sections of this Standard as appropriate to the project scope, or in accordance with the contract language for the project. Engineering firms that perform work for the NJTA are expected to comply with these standards as a specification for CADD work.

1.5 GRAPHIC CONCEPTS

Drawing files (.dwg) can contain both vector and non-vector elements. The vector design files can contain text, lines, arcs, shapes and grouped elements. Grouped elements are either blocks, graphic groups, or complex elements. Non-vector elements include raster or binary data.

AutoCad 2002 drawing files may contain any number of layers for placing elements. Graphic elements shall be separated by layer depending on the final uses of the file. For example, many elements shown on a particular plan sheet may not be needed on another. By placing elements on different layers, the designer can control which elements are displayed and which are not.

General file format specifics are to be followed when setting up drawing files for project deliverables. They are as follows:

1. Each drawing will be a separate file. **No XREFs will be accepted.**
2. All information or elements outside of the image/drawing area will be eliminated from the DWG file.
3. The layering convention must follow the included outline as shown in Generic Layering Convention and Color Numbers on page 9.
4. Drafting standards will be outlined in the Authority's Design Manual.

5. Any exclusive or special fonts used in the creation of the DWG files must be included.
6. If converting from another CADD software application, all DWG files shall be checked for consistency as to match the hard copy contract plans. This includes all text fonts, symbols, linetypes, etc., or other entities particular to a specific application.

1.6 SHEET FILES

Sheet files are design files that display information for a specific type plan sheet (construction, tie and grade, etc.). These are the files from which hard copy is typically plotted to produce a set of plans. If external referencing (XREF) is used in the creation of sheet files, the sub-commands BIND / INSERT shall be utilized, making all data and objects permanent parts of each drawing file. In any case, let it be known that each drawing will be a separate file, independent of any directory paths set and/or existing base files.

1.7 GRAPHIC STANDARDS

The following graphic standards are considered generic and common to all internal NJTA users. Standards considered specific to individual work groups will be addressed as needed. The fundamental goal of CADD is the computer-automated preparation of plans that graphically meet conventional drafting standards as shown in NJTA standard drawings, and exchangeable digital CADD files. While other users of this Standard may make modification in order to get the files to work properly on their system, any digital files submitted to the NJTA for subsequent CADD work to be performed by the NJTA require absolute adherence to this Standard in all aspects.

1.7.1 Plan Sheet Size

Unless otherwise specified through job specific contract language, the final plan sheet size will be 36 in. x 22 in.

1.7.2 Working Units

The resolution and scaling of the design file affects the accuracy of the drawing. The working units, or number of positional units used to define the sub units and master units will determine the accuracy of the design file. The accepted working units for all drawing files will be feet and inches.

1.7.3 Scales

No scale will be associated with elements in a design file; drawings shall be done to real dimensions. For example, if telephone poles are 25 yards apart, then they will measure 25 yards in the design file. Scaling of the final product is performed using plotting utilities or VIEWPORT command setup.

1.7.4 Global Origin

Since most drawings utilize coordinate systems with positive X and Y values, the standard global origin is set to zero for the X and Y coordinates at the lower left corner of the X-Y plane.

1.7.5 Text

Text size and placement shall be in accordance with NJTA Drafting Standards. These sizes are selected for the express purpose of proper readability on the scaled plot. They have evolved to correlate with traditional Leroy Board sizes.

1.7.6 Fonts

Generally, standard text using the various *.shx font files shall be used, such as style ROMANS with font ROMANS.SHX. True Type fonts are to be avoided.

1.7.7 Line Weights

The use of line weights to produce the graphic image shall be in accordance with NJTA Drafting Standards. Generally, existing features are shown thinner than the proposed work. In order to resolve the problems encountered when plotters of different manufacturers are used for output, a pen table is used. The NJTA has based the creation of its in-house CADD files primarily on the first twelve basic AutoCad colors with the corresponding line weights as follows:

PEN COLOR & WIDTH IN INCHES

1 = (.013) Red	5 = (.032) Blue	9 = (.023)
2 = (.015) Yellow	6 = (.013) Magenta	10 = (.015)
3 = (.015) Green	7 = (.032) White	11 = (.015)
4 = (.027) Cyan	8 = (.023) Gray	12 = (.020)

1.7.8 Line Styles

A variety of line styles are available in order to produce highway plans. Line styles are to be used that are compatible to both MicroStation and AutoCad software applications.

1.7.9 Layers

Graphic elements shall be placed on the layers called for by each discipline. Some types of plans may utilize extensive layering schemes while others may be minimal. As with all of this Standard, adherence to specified layers is NOT optional. (Also see page 9 – Generic Layering and Color Numbers.)

1.7.10 Colors

Use of colors in design files will conform to the requirements of the specific discipline work group. The number of the color is more significant than the displayed color. All assigned colors shall be "bylayer."

1.7.11 Reference Files

Reference files are a powerful tool. The consultant has total control over how a particular project is to be created, linked together, and/or file referenced from within their particular design teams. However, the NJTA, as previously mentioned, requires all files included in final contract deliverables to be independent of all file referencing (XREF). **No XREFs will be accepted.**

1.8 DELIVERABLES AND DATA EXCHANGE

Any exchange of data between the NJTA and the A/E community will necessitate answering many questions about media, formats, etc. so that the exchange will be as efficient as possible.

1.8.1 Media

The accepted media for file exchange are the rewritable compact disk (CD-RW) and the Internet. Each CD jewel box containing the rewritable compact disk will have a label indicating the contents. It shall be accompanied with a supporting letter of documentation describing the contents and signifying all responsible contact persons associated with the creation and delivery of the electronic AutoCAD files comprising any contract deliverable.

The rewritable compact disk (CD-RW) is currently the easiest and most efficient medium utilized by the Turnpike Authority for file exchange of contract deliverables. Please utilize this type of medium whenever possible.

GENERAL FORMAT

CONTRACT NUMBER

MILE POST to MILE POST

TITLE

TITLE

TITLE

SHEET NUMBERS

The NJTA encourages the consultant community to use the Internet as another option for delivering/receiving electronic files on an "as need" basis. This could be accomplished through the consultant's own web page, through an "ftp" site that the consultant would establish or conventional email. The NJTA does not currently have an operational ftp site. All files that are to be transferred via the Internet should be in PKZIP compressed format.

1.8.2 Format

Only files in AutoCad format will be accepted.

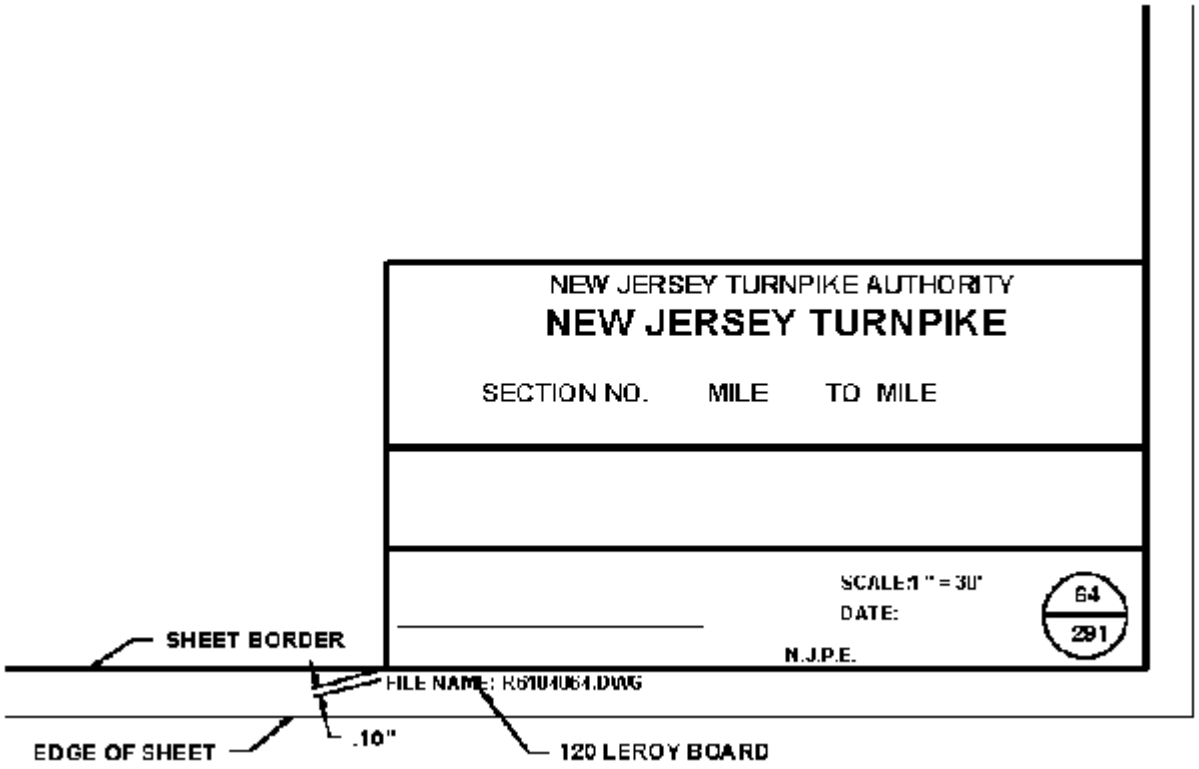
1.8.3 Sheet File Naming Conventions

The file name is to be placed on every drawing. To insure uniformity the file name will be comprised of combining the contract number and the sheet number such that the resulting file name will be XXXXXZZZ.DWG.

Where:

XXXXX is the Contract Number (e.g. Contract Number R-6104 is presented as R6104).

ZZZ is the sheet or drawing number (e.g. sheet 64 of 291 is presented as 064).



Therefore, the above example file name is:

FILE NAME: R6104064.DWG

And is to be placed as illustrated above.

1.8.4 Deliverables

All graphics design (.dwg) files provided to the NJTA shall be compatible with the AutoCad 2002 format. When AutoCad files are created by translating from a different format, the Consultant is solely responsible to ensure and verify that the required information has been translated correctly and completely, for the intended purpose. Anything that does not conform to our Standard will be returned for correction, without additional compensation or schedule allowance.

GENERIC LAYERING CONVENTION AND COLOR NUMBERS

PEN COLOR & WIDTH IN INCHES

1 = (.013) Red
2 = (.015) Yellow
3 = (.015) Green
4 = (.027) Cyan
5 = (.032) Blue
6 = (.013) Magenta
7 = (.032) White
8 = (.023) Grey
9 = (.023)
10 = (.015)
11 = (.015)
12 = (.020)

*NOTE: All assigned colors are to be ***BYLAYER***.

GENERAL LAYERS

GNOTES - General notes, schedules (4)
SHTBDR - Title blocks and title block text (7)
MLINES - Match lines and text (5)
MISC-GRAFX - North arrows, bar scales, misc. sheet graphics (2)
GRIDCOORD - Grid coordinate system and text (1)
DATUM - Datum and extension lines (5) datum (2) ext.
MISC-GEO - Miscellaneous geotechnical information
MISC-TEXT - Miscellaneous text

EXISTING LAYERS

E-TXT - Existing general text (2)
E-TOPO-TXT - Existing topographical text (1) or (6)
E-ROW-TXT - Existing right of way text (2)
E-DRN-TXT(E-STRM-TXT) - Existing drainage text (1) or (6)
E-SOILS-TXT - Existing soils text (2)
E-SOILS - Existing soils (2)
E-DRN(E-STRM) - Existing pipes, inlets, headwalls, etc. (1) or (6)
E-TOPO - Existing trees, shrubs, streams, etc. (1) or (6)
E-MMTOPO - Existing manmade planimetrics (roads, buildings, fences, etc.) (1) or (6)

EXISTING LAYERS

E-UTIL - Existing utilities (1) or (6); Can be broken down. ei. - E-WAT, E-TEL, E-ELEC, etc.
E-CONT - Existing contours, spot elevations, etc. (1) or (6)
E-ROW - Existing right of way lines, property lines, monuments, etc. (2)

PROPOSED LAYERS

P-TXT - Proposed directive text (4)
P-ROW-TXT - Proposed right of way text (4)
P-DRN-TXT(P-STRM-TXT) - Proposed drainage text (4)
P-STATION - Proposed baseline stationing text (3) or (4)
P-DRN(P-STRM) - Proposed pipes, inlets, headwalls, etc. (7)
P-DESIGN - Proposed roadway, curbs, barriers, etc. (4); Can be broken down. ie. - P-RDWY, P-BARR, etc.
P-UTIL - Proposed utilities (4)
P-ROW - Proposed right of way lines, monuments, easements, etc. (4)
P-TOE - Proposed limit of construction (toe of slope) (2)
P-TOP - Proposed top of cut (2)
P-PAVE-SYM - Proposed pavement symbols (2)
P-SEDIMENT - Proposed soil erosion and sediment control (3) ie. - silt fences, inlet protection, etc.
P-CONT - Proposed grading, contours, spot elevations, etc. (3)
P-SOILS - Proposed soils work. ei - boring locations (3)
P-SOILS-TXT - Proposed soils text (4)
P-SIGNS - Proposed signing (4)
P-PSTRIPE - Proposed paint striping (4)
P-SIGNAL - Proposed signalization (3) or (4)
P-MP-TRAFF - Proposed maintenance and protection of traffic (3) or (4)
P-LIGHT - Proposed lighting (3)

MISC. STRUCTURAL LAYERS

B-DIM - Bridge dimensions and section marks (1) or (2)
B-TXT - Bridge text (8)
B-REIN - Bridge reinforcement (2)
B-STEEL - Bridge steel (3) or (4)
B-MISC - Bridge miscellaneous
EB-STRUCT - Existing bridge structure (1)

MISC. POINT MANAGEMENT

PNT-SYM - COGO point symbols (2)
PNT-NUM - COGO point numbers (2)
PNT-TRAV - Survey traverse points (2)
MISC-PNTS - Temporary catch all for miscellaneous COGO points (2)

NOTE:

In the development of CADD files, layering can become cumbersome, inconsistent and generally outright confusing. In order to avoid some of the confusion which will inevitably arise without any CADD guidelines being set forth for our consultants, it is suggested the above general layer naming format be used as a guide. This layer naming format is not intended to be used verbatim, but should be followed as closely as possible as to create a consistent outline for the Turnpike Authority to use for all consultants.

The above layer names used in this format are only a few examples of the possible dozens which may arise depending on the type of contract and scope of design. These CADD layering guidelines, however, will make it clear to all consultants as to how the Turnpike Authority will expect a clear and concise layering procedure to be used for all future CADD files.

INFORMATION SHEETS

It is expected that these files will be maintained for a considerable amount of time. It is also expected that various information will be requested by the Authority or offered by the Consultant to explain the contract or qualify data. Loose papers will eventually get separated from the CADD files and probably lost. Therefore all supporting documentation requested by the Authority or provided by the Consultant is to be a part of the CADD files. This information is to be placed on standard turnpike plan sheets (120 Leroy upper & lower case) and made into a file. These information sheets are to be labeled alphabetically, starting with 'A', and provided with file names accordingly (e.g. FILE NAME: R610400A.DWG).

Information that is to be shown on these sheets will include:

1. The N.J.T.A. liaison engineer.
2. The AutoCAD version used.
3. The DWG file layering convention.
4. The advertisement for proposal pages from the bid.
5. List of drawings in the contract with an asterisk (*) placed to the left of each drawing not included in the CADD files. The only drawings that will not be included will be Standard Drawings and Reference Drawings.